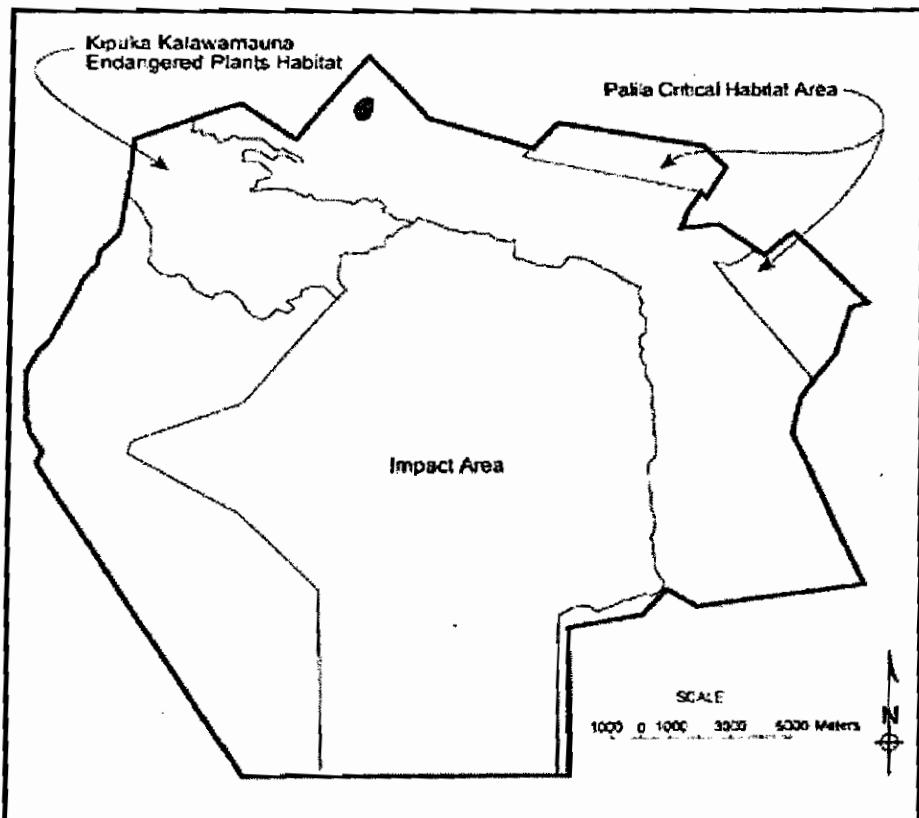


Figure 46. Distribution of *Portulaca villosa* on Pohakuloa Training Area, Hawaii.



Schiedea pubescens Hillebr.



Family: Caryophyllaceae (Pink Family)

Common Name: None

Federal Status: Species of Concern

Description:

Life Span: perennial. **Habit:** vine; stems from a woody base, sprawling to weakly climbing, 1-6 m or more in length. **Vegetative:** leaves and branching opposite; leaves lanceolate to ovate, short petioled, only one-nerved, purple-tinged, and chartaceous. **Fruit:** a small capsule with numerous small seeds.

Distribution:

Historical: Oahu, Molokai, Lanai, and Maui. **Current:** Reported widely scattered in mesic forests.

Habitat:

Substrate: The only known population of *Schiedea pubescens* on the installation occurs on 3000-4000 year old Mauna Loa pahoehoe lava. **Plant Communities:** Open *Metrosideros*

Treeland with dense shrub understory.

Estimated Number of Individuals on PTA: < 10

Threats: Browsing by feral sheep and goats is the major threat to *S. pubescens*. Also, competition from weedy, invasive species and increased fire potential from fountain grass (*Pennisetum setaceum*) threatens the species.

Comments: This is the first report of *S. pubescens* from the island of Hawaii, according to Joel Lau. The plant was discovered growing on the installation by Trisha Tierney and Sam Gon while they were viewing a *Zanthoxylum hawaiiense* which grows nearby. A few seedlings were found growing near the larger "mother plant". Other populations of this taxon undoubtedly occur on the installation. The plants found on the installation probably belong to the typical variety (*S.p. var. pubescens*) which has puberulent inflorescences and broadly lanceolate to ovate leaves.

Figure 47. *Schiedea pubescens*: (a) general habit; (b) dehisced capsule.

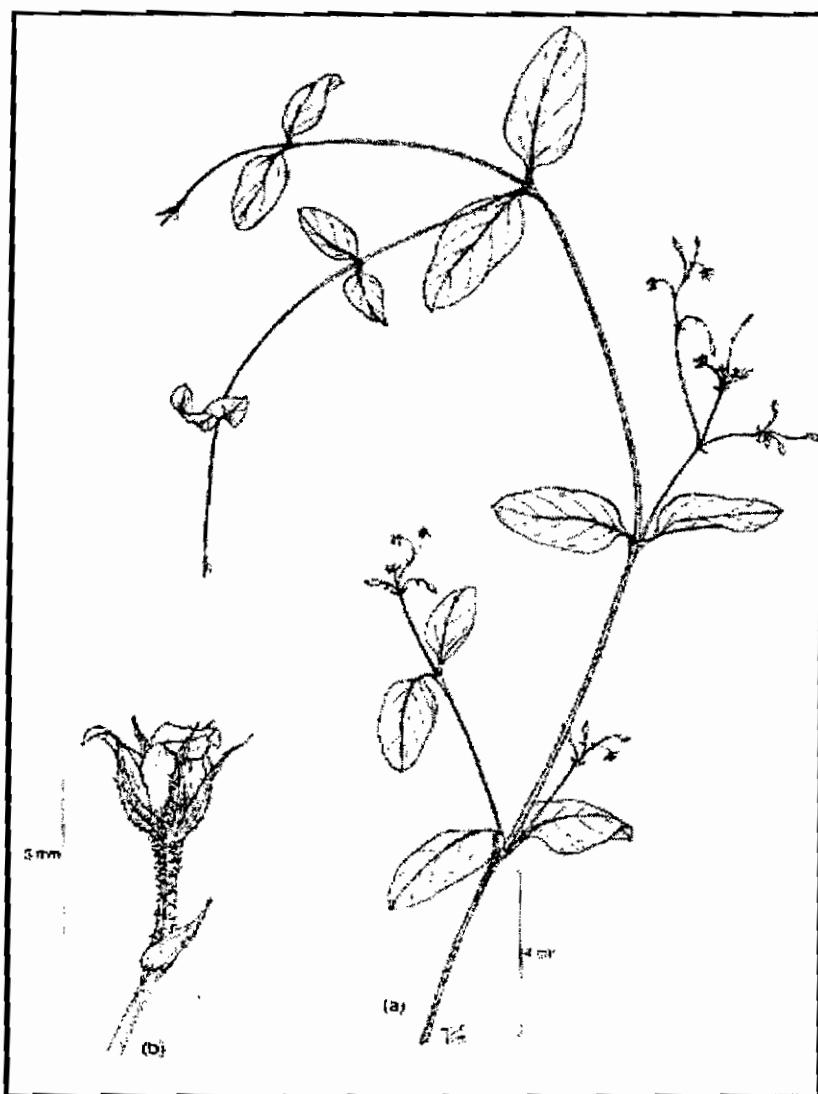


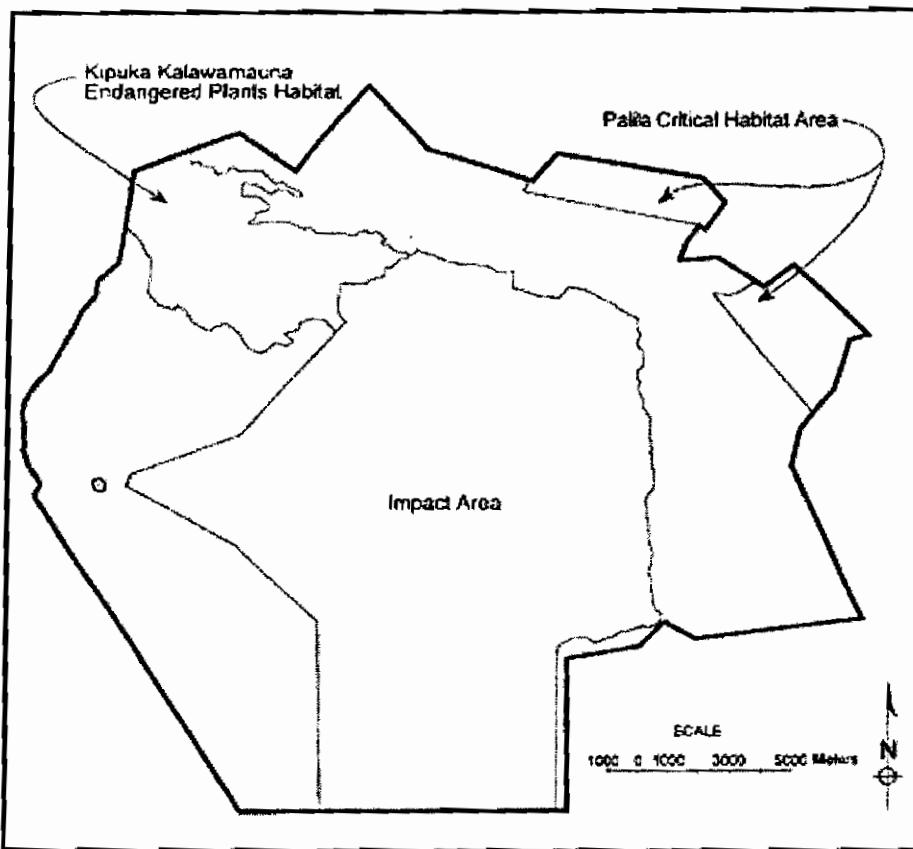
Figure 48. *Schiedea pubescens*: (a) small seedling growing in pahoehoe lava crack; (b) mature individual growing at base of *Metrosideros polymorpha*; (c) stem showing vine-like nature of the plant

and opposite leaf arrangement; and (d) typical habitat in Open *Metrosideros* Treeland with dense shrub understory.

Below clockwise from upper left:



Figure 49. Distribution of *Schiedea pubescens* on Pohakuloa Training Area, Hawaii.



Silene hawaiiensis Sheriff



Family: Caryophyllaceae (Pink Family)

Common Name: Hawaiian Catchfly

Federal Status: Threatened

Description:

Life Span: perennial. **Habit:** erect to sprawling shrub up to 1.5 m tall, but rarely over 0.5 m; typically has multiple stems arising from a large, tuber-shaped taproot. **Vegetative:** stems very thin, round; leaves opposite, narrow (< 1 mm wide) and linear, recurved, usually hairy, and margins entire. **Floral:** flowers in a small, simple, panicle inflorescence; flowers greenish white to white above and maroon below, and completely maroon when dry; 5 petals, fused at the base, and cleft. **Fruits:** a capsule with numerous small seeds.

Distribution:

Historical: Hawaii. **Current:** Known from Kilauea Crater and Rim and Kau Desert within Hawaii Volcanoes National Park, the slopes of Mauna Kea and Mauna Loa to about 2,750 m and throughout PTA. On PTA, the species occurs from the northern boundary of the installation to the Kipuka Alala on the west side and Puu Koli on the east side. One of the largest populations is located at mid-slope on the west-southwest flank of Puu Ahi.

Habitat:

Substrate: *Silene hawaiiensis* is scattered on very old Mauna Kea flows (> 10,000 years old). It also is abundant on Mauna Loa aa and pahoehoe flows varying from 900 to over 5,000 years old. **Plant Communities:** Barren Lava, Disturbed, Sparse *Metrosideros* Treeland, Open *Metrosideros* Treeland with sparse shrub understory, Open *Metrosideros* Treeland with dense shrub understory, *Chenopodium* Shrubland, Open *Dodonaea* Shrubland, *Dodonaea* Mixed Shrubland, *Sophora-Myoporum* Shrubland with forb understory, *Styphelia-Dodonaea* Shrubland, and *Eragrostis* Grassland.

Estimated Number of Individuals on PTA: > 1,500

Threats: The above-ground portion of the plant is highly palatable to feral sheep and goats. Feral hogs root up and consume the fleshy taproot of individuals growing in areas with better soil development.

Comments: *Silene hawaiiensis* is widespread on the installation. The plant appears to be relatively hardy, perhaps due to its ability to re-sprout from the large fleshy taproot. Seeds germinate readily and seedlings are easy to establish in the greenhouse.

Figure 50. *Silene hawaiiensis*: (a) general habit showing the large fusiform root; (b) opposite, subulate leaves with ciliate margins; (c) single, regular-shaped flower; (d) calyx split to reveal elongated stipe (note slightly exposed stamens); and (e) capsule cross-section exposing numerous seeds.

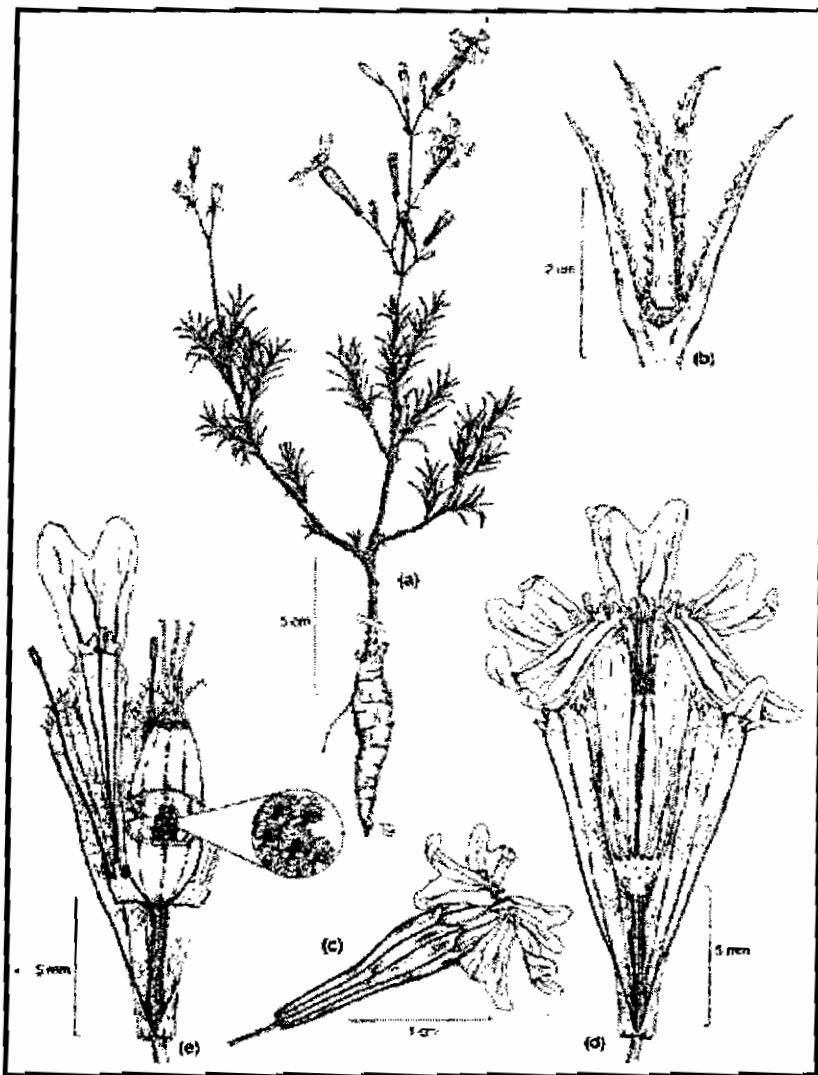


Figure 51. *Silene hawaiiensis*: (a) plant growing at edge of pahoehoe lava flow; (b) close-up of flower (note exposed stamens [yellow] and two-lobed appendages [white]); (c) typical habitat in Open Metrosideros Treeland with dense shrub understory; and (d) typical Open *Dodonaea* Shrubland habitat. Below clockwise from upper left:

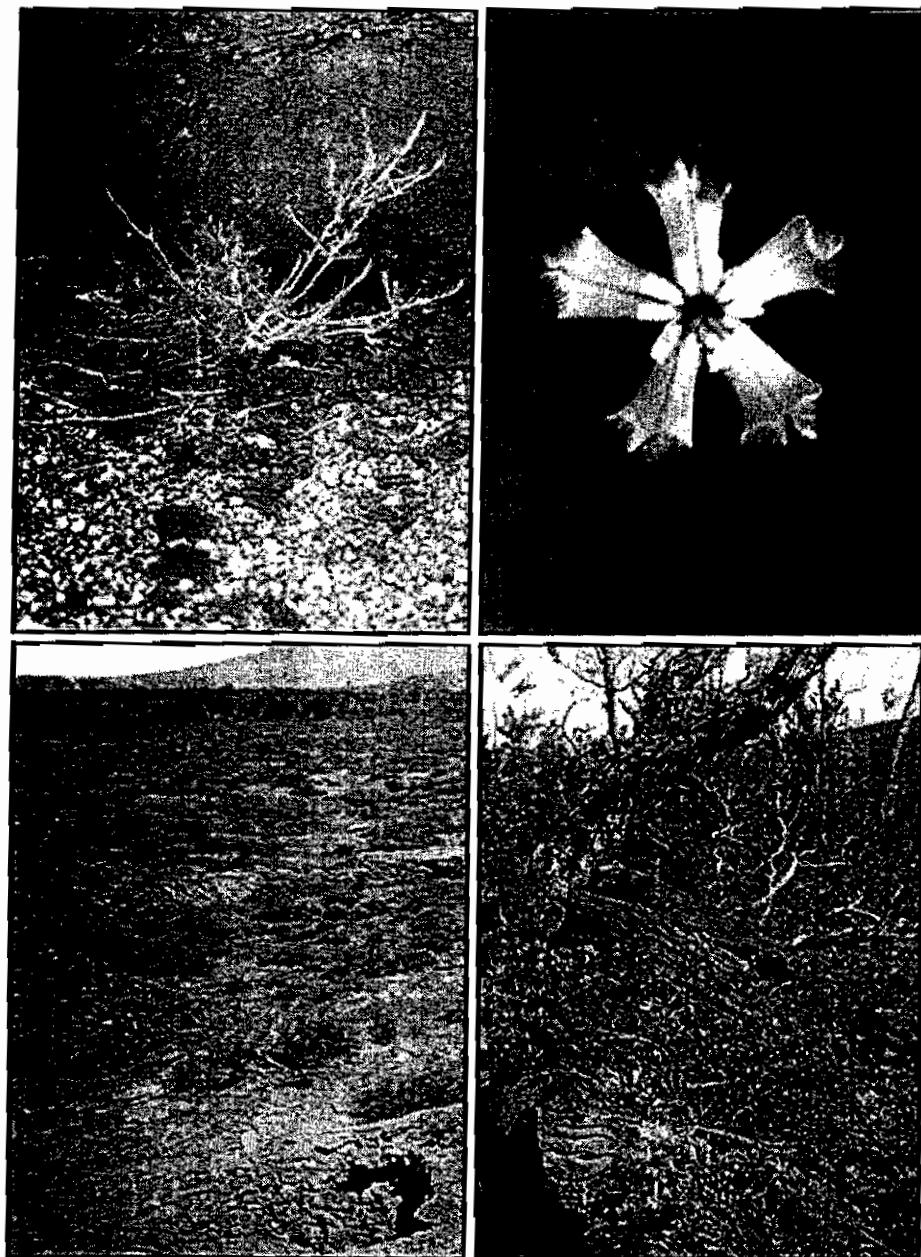
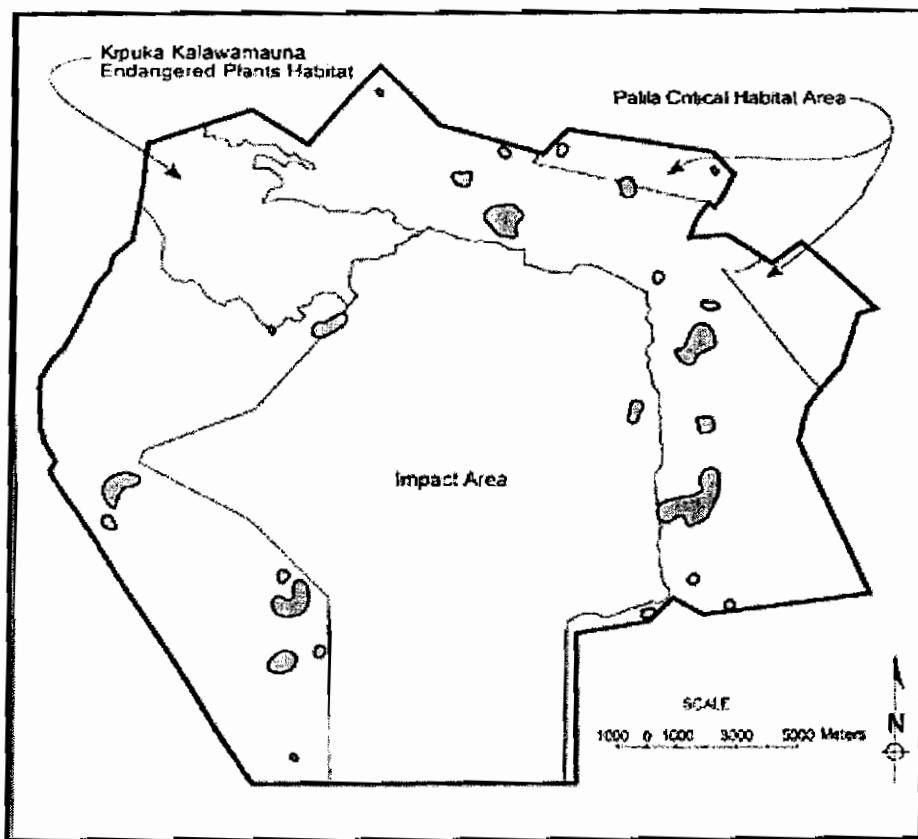


Figure 52. Distribution of *Silene hawaiiensis* on Pohakuloa Training Area, Hawaii.



Silene lanceolata A. Gray



Family: Caryophyllaceae (Pink Family)

Common Name: Lance-leaf Catchfly

Federal Status: Endangered

Description:

Life Span: perennial. **Habit:** erect to sprawling shrub up to 1.5 m tall; single stemmed at base of plant and multiple branched above. **Vegetative:** stems round; leaves linear to lance-shaped, hairless, smooth and shiny, margins entire. **Floral:** showy flowers in an open inflorescence at the tip of most branches; flowers regular-shaped, base sticky, petals white and cleft. **Fruit:** a capsule with numerous small seeds.

Distribution:

Historical: Kauai, Lanai, Molokai, and Hawaii. **Current:** One small population is known from below Puu Kolekole on Molokai, and on PTA from Puu Keekee to the Kipuka Alala. Recently, several populations have been found on state lands west of PTA.

Habitat:

Substrate: *Silene lanceolata* is abundant on very old Mauna Kea aa and pahoehoe flows (> 10,000 years old). It also is abundant on Mauna Loa aa and pahoehoe flows varying from 900 to over 5,000 years old. **Plant Communities:** *Chamaesyce* Treeland, Open *Metrosideros* Treeland with sparse shrub understory, Open *Metrosideros* Treeland with dense shrub understory, Intermediate *Metrosideros* Mixed Treeland, Open *Dodonaea* Shrubland, Dense *Dodonaea* Shrubland, *Dodonaea* Mixed Shrubland, *Myoporum* Shrubland, *Myoporum-Dodonaea* Shrubland, *Myoporum-Sophora* and Mixed Shrubland.

Estimated Number of Individuals on PTA: > 2,500

Threats: *Silene lanceolata* is very palatable to feral sheep and/or goats, which have decimated populations of the species. Invasion of *S. lanceolata* habitat by fountain grass (*Pennisetum setaceum*) also could threaten the species. Wildfire has impacted the species negatively.

Comments: Populations of *S. lanceolata* appear to be viable and "healthy." The species is capable of establishing itself and growing successfully in a wide range of habitats. It can be found in plant communities growing on very old substrates (> 10,000 years old) or on very young aa or pahoehoe flows (900 years old). The plant is propagated easily.

Figure 53. *Silene lanceolata*: (a) flower branch; (b) opposite leaves with entire margins; (c) single, regular-shaped flower with five petals; (d) calyx split to show stamen filament bases and fused petal bases; and (e) capsule cross-section exposing numerous kidney-shaped seeds.

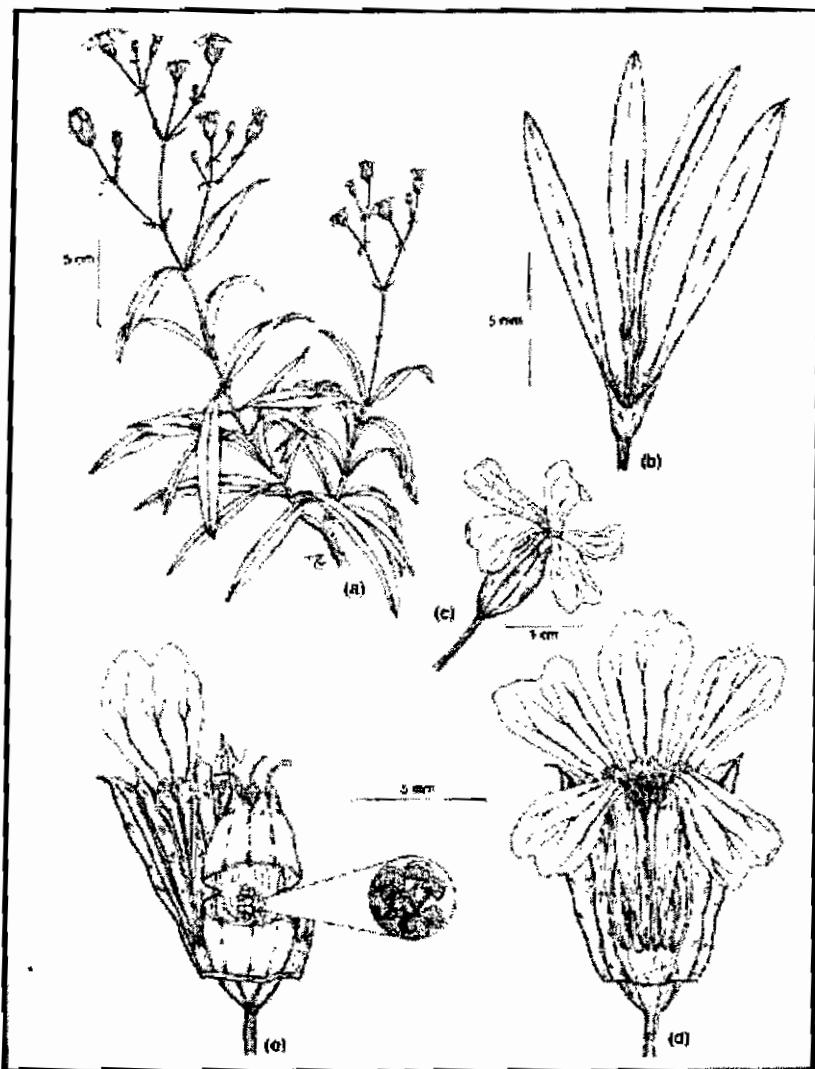
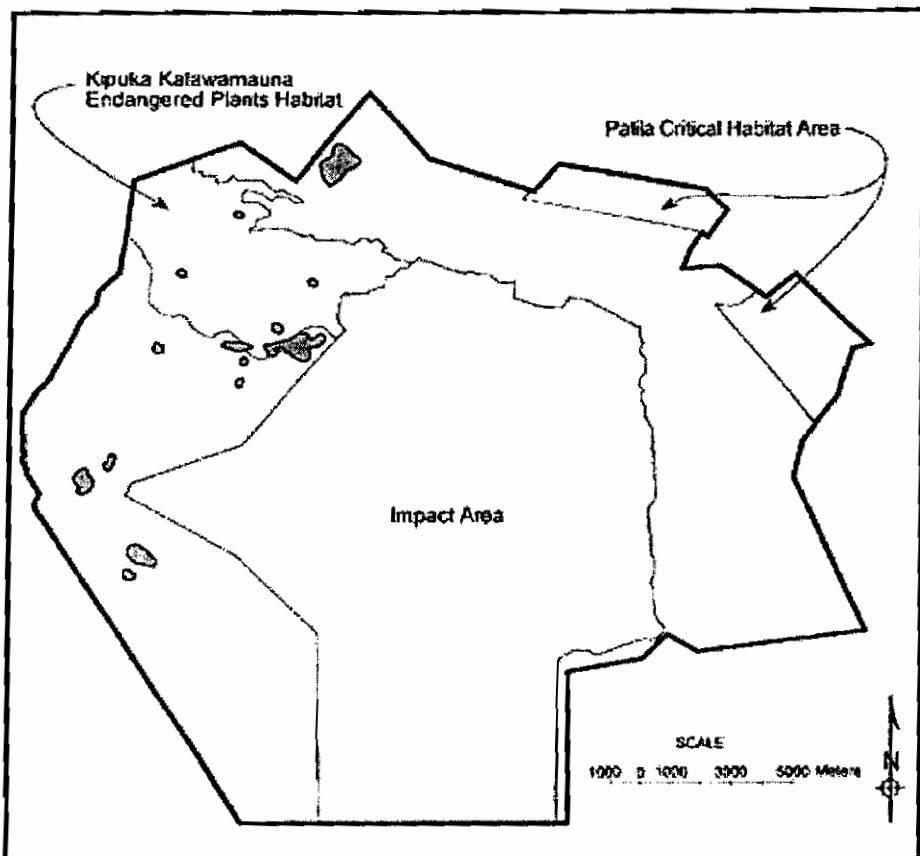


Figure 54. *Silene lanceolata*: (a) plant growing on barren pahoehoe lava; (b) close-up of inflorescence and flowers; (c) typical habitat in Open *Metrosideros* Treeland with dense shrub understory; and (d) *Myoporum* Shrubland habitat within Kipuka Alala.

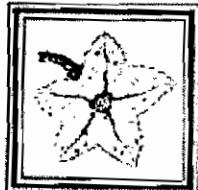
Below clockwise from upper left:



Figure 55. Distribution of *Silene lanceolata* on Pohakuloa Training Area, Hawaii.



Solanum incompletum Dunal



Family: Solanaceae (Nightshade Family)

Common Name: Hawaiian Prickle Leaf, Popolo

Federal Status: Endangered

Description:

Life Span: perennial. **Habit:** small shrub up to 3 m tall; suckers from the base. **Vegetative:** stems and leaves armed with prominent red-orange prickles. **Floral:** flowers perfect, regular; petals white. **Fruit:** a yellow or orange berry that probably turns black when mature.

Distribution:

Historical: Kauai, Lanai, Molokai, Maui and Hawaii. **Current:** Last reported sighting was on the island of Hawaii at Puu Huluhulu in saddle region over 45 years ago.

Habitat:

Substrate: A population of this species was found growing in a 5,000-yearold Mauna Loa

pahoehoe flow surrounded by younger (4,200-year old) aa flows. **Plant Communities:** Sparse *Metrosideros* Treeland and *Myoporum* Shrubland.

Estimated Number of Individuals on PTA: Only 9 adults and 2 seedlings have been found on the installation.

Threats: The small number of individuals is a major concern. Also, feral sheep and/or goats have browsed most of the adult plants.

Comments: *Solanum incompletum*, *Neraudia ovata* and *Hedyotis coriacea* are the rarest and most threatened plants at PTA because of their small numbers and palatability to feral ungulates. Areas where these species occur should be fenced to protect the plants or, at the very least, individual plants should be caged.

Figure 56. *Solanum incompletum*: (a) upper portion of stem illustrating alternate leaf arrangement and prominent prickles on major veins; (b) stellate hair, which covers much of the plant; (c) compound cyme inflorescence; (d) regular-shaped flower with five petals; and (e) berry-type fruit.

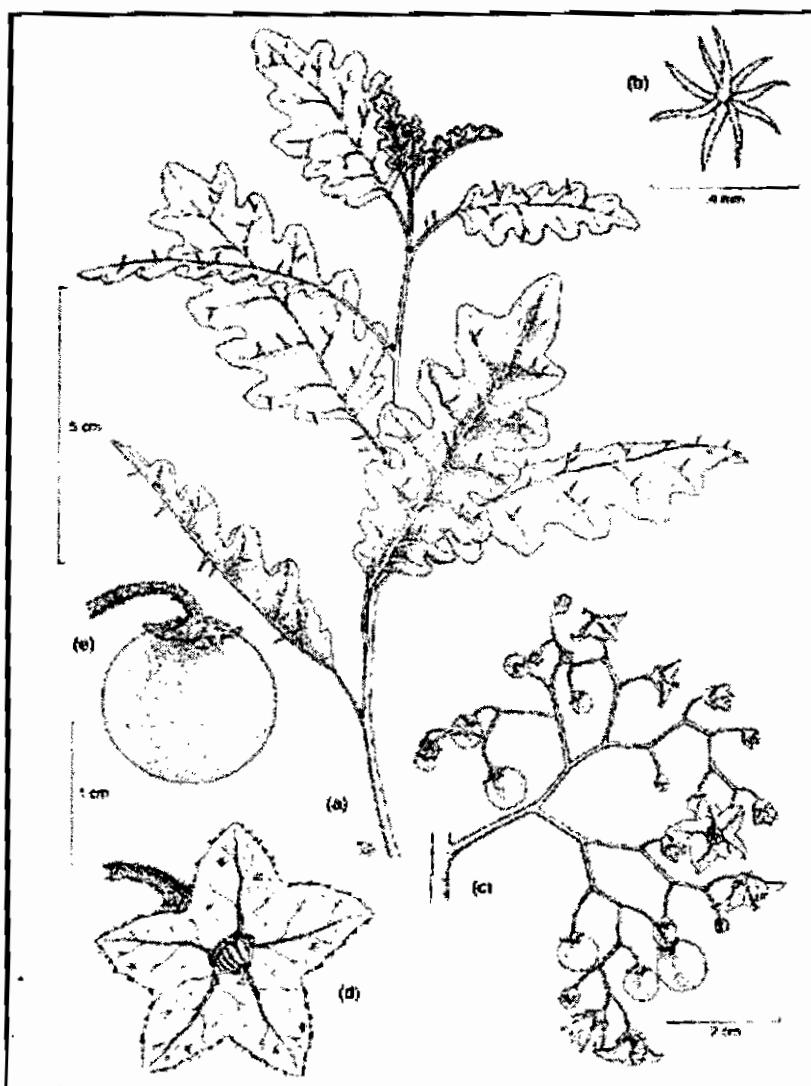
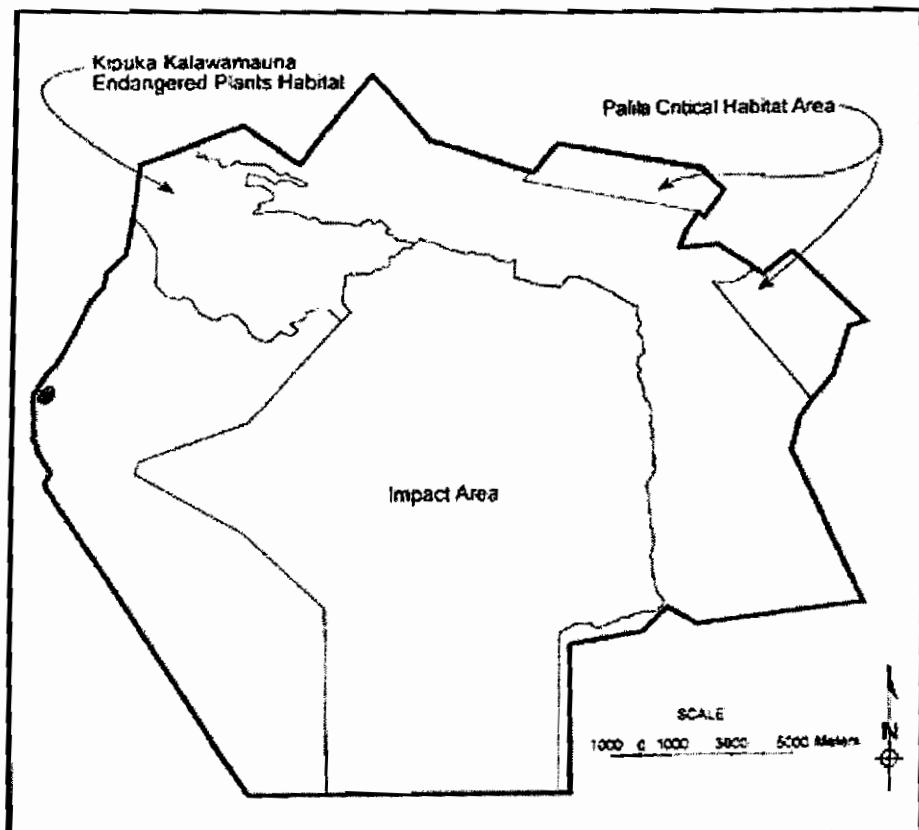


Figure 57. *Solanum incompletum*: (a) plant growing under *Myoporum sandwicense* shrub; (b) underside

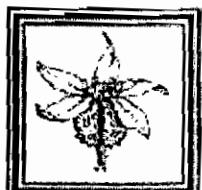
of leaf exposing golden-red prickles along midrib and major veins; (c) typical *Myoporum* Shrubland habitat; and (d) grove of *Myrsine lanaiensis* and *Neraudia ovata* in which the species was found.
Below clockwise from upper left:



Figure 58. Distribution of *Solanum incompletum* on Pohakuloa Training Area, Hawaii.



Spermolepis hawaiiensis Wolff



Family: Apiaceae (Umbelliferae, Parsley Family)

Common Name: Hawaiian Parsley

Federal Status: Endangered

Description:

Life Span: annual. **Habit:** an erect herb arising from a taproot. **Vegetative:** stems glabrous; leaves alternate with a sheathing petiole and compound with linear segments. **Floral:** flowers in compound umbels opposite the upper leaves and regular; petals white. **Fruit:** fruit 3-4 mm long, nearly round, ribbed, and covered with hooked spines.

Distribution:

Historical: Kauai, Oahu, Molokai, Maui and Hawaii. **Current:** Collected within the last ten years on Oahu, Maui, and Hawaii. At PTA, found in Kipuka Alala and scattered throughout the southwestern part of the installation.

Habitat:

Substrate: *Spermolepis hawaiiensis* has been found on moderately old (1,000-2,000-year old) to very old (> 6,000-year old) Mauna Loa flows. It typically grows in ash and soil pockets where moisture frequently accumulates. **Plant Communities:** Open *Metrosideros* Treeland with sparse shrub understory, *Myoporum-Sophora* Mixed Shrubland, and *Myoporum-Sophora* Shrubland with forb understory. May be more widespread across the installation and, like *Hesperocnide sandwicensis*, could occur in any moist area.

Estimated Number of Individuals on PTA: > 1,000

Threats: Plants browsed by feral sheep and/or goats have been observed within the Kipuka Alala. Clearing of overstory woody plant cover and reshaping substrate for construction of roads, etc., would adversely impact the habitat needed by this species.

Comments: Joel Lau made the first discovery of this species on PTA. Since then, *S. hawaiiensis* has been found in various locations in the southwestern part of the installation. *Spermolepis hawaiiensis* can be confused with the much more common *Daucus pusillus* (American Carrot). They are easily distinguished in the field because *D. pusillus* stems are very hairy, while the stems of *S. hawaiiensis* are glabrous.

Figure 59. *Spermolepis hawaiiensis*: (a) general habit; (b) ternately compound leaf with sheathing leaf base; (c) compound umbel inflorescence; (d) single flower showing inferior ovary; and (e) fruit covered with tubercles.

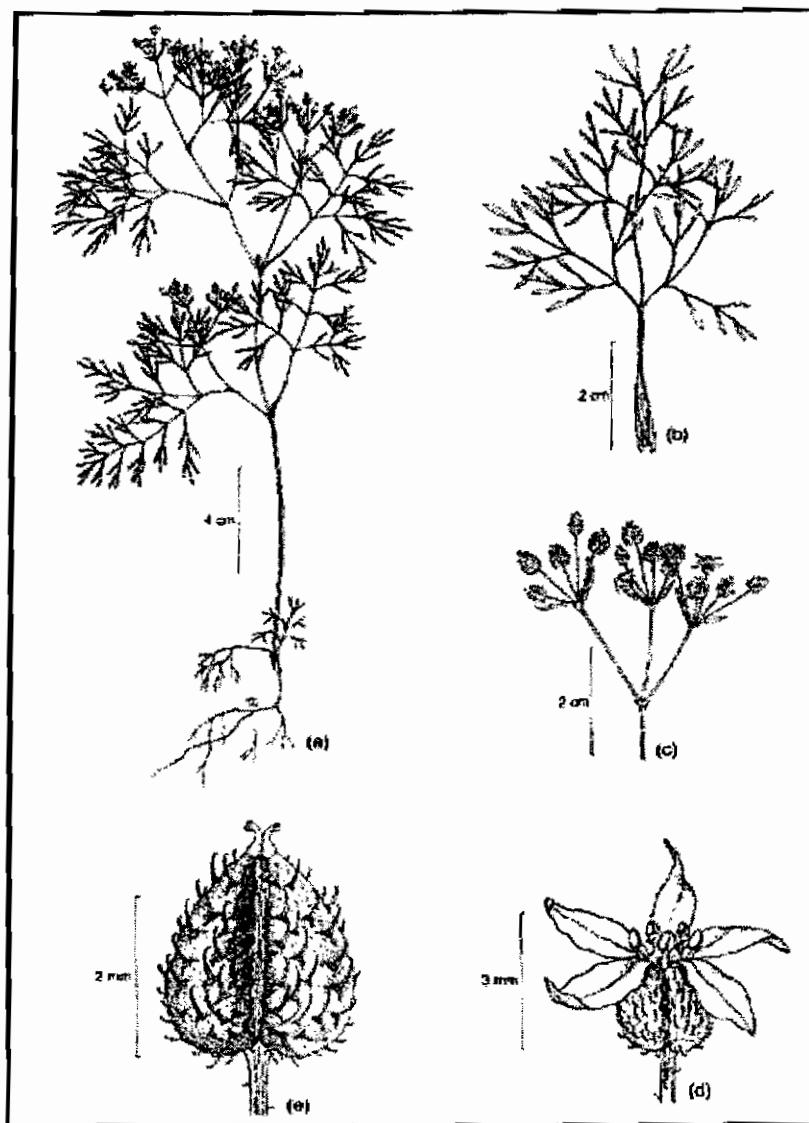
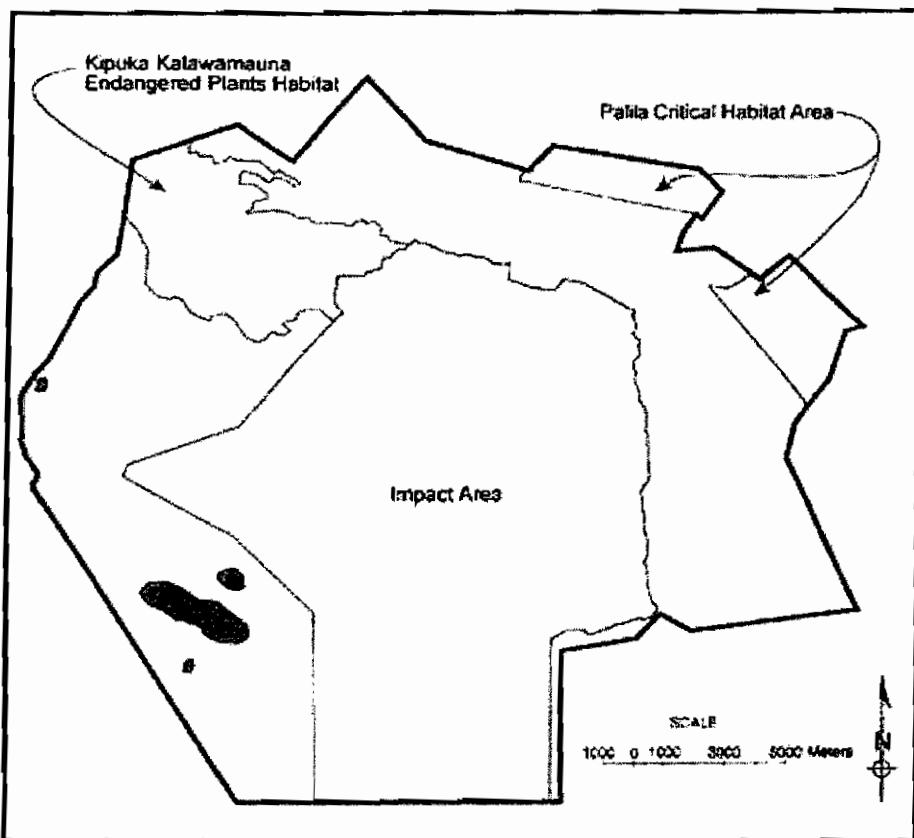


Figure 60. *Spermolepis hawaiiensis*: (a) ternately compound leaf; (b) simple flowers; (c) compound umbel with developing fruit; and (d) typical *Myoporum-Sophora* Mixed Shrubland habitat within Kipuka Alala.

Below clockwise from upper left:



Figure 61. Distribution of *Spermolepis hawaiiensis* on Pohakuloa Training Area, Hawaii.



Stenogyne angustifolia A. Gray



Family: Lamiaceae (Labiatae, Mint Family)

Common Name: Creeping Mint

Federal Status: Endangered

Description:

Life Span: perennial. **Habit:** low growing vine with horizontal above- and below-ground stems, becoming slightly woody at the base. **Vegetative:** stems square; leaves opposite, usually lance-shaped, margins evenly toothed. **Floral:** usually one flower at the base of each leaf; red, maroon, or (rarely) yellow, and irregularly shaped. **Fruit:** four small, black, very hard nutlets per flower.

Distribution:

Historical: Molokai, Maui, and Hawaii. **Current:** Previously reported only from PTA; however, the species has been collected recently at Waikoloa and Puu Anahulu (on Hawaii). At PTA, the species is distributed from Kipuka Kalawamauna to Kipuka Alala on the west side of PTA.

Habitat:

Substrate: *Stenogyne angustifolia* is abundant on very old Mauna Kea aa and pahoehoe flows (> 10,000 years old). The species is also abundant on Mauna Loa aa and pahoehoe flows varying from 900 to over 5,000 years old. **Plant Communities:** *Chamaesyce* Treeland, Open *Metrosideros* Treeland with sparse shrub understory, Open *Metrosideros* Treeland with dense shrub understory, Intermediate *Metrosideros* Mixed Treeland, Open *Dodonaea* Shrubland, *Dodonaea* Mixed Shrubland, *Myoporum-Dodonaea* Shrubland, *Myoporum* *Sophora* Mixed Shrubland, *Myoporum* Shrubland, and *Styphelia* Mixed Shrubland.

Estimated Number of Individuals on PTA: > 100,000

Threats: Rooting activities by feral hogs could damage and kill the underground stems of this species; however, it does not appear to be highly palatable to feral sheep and goats and is only consumed during the driest periods or after fire. Invasion of *S. angustifolia* habitat by fountain grass (*Pennisetum setaceum*) also could impact the species negatively.

Comments: *Stenogyne angustifolia* hybridizes with both *S. rugosa* and *S. microphylla* on PTA. Within the Kipuka Kalawamauna Endangered Plants Habitat, individuals of *S. angustifolia* occasionally have more than two flowers at each node, which is more characteristic of *S. rugosa*. The species can be propagated rather easily from seeds or cuttings.

Figure 62. *Stenogyne angustifolia*: (a) horizontal, above-ground stem showing branches and roots arising from a node; (b) simple, lance-shaped leaf with evenly toothed margins; (c) a single two-lipped flower; (d) corolla tube opened to expose four stamens; stamens adnate to the corolla wall and included within the upper lip of the flower; two-lobed style; (e) top view of ovary showing four nutlets; and (f) back, front, and cross-section of nutlet.

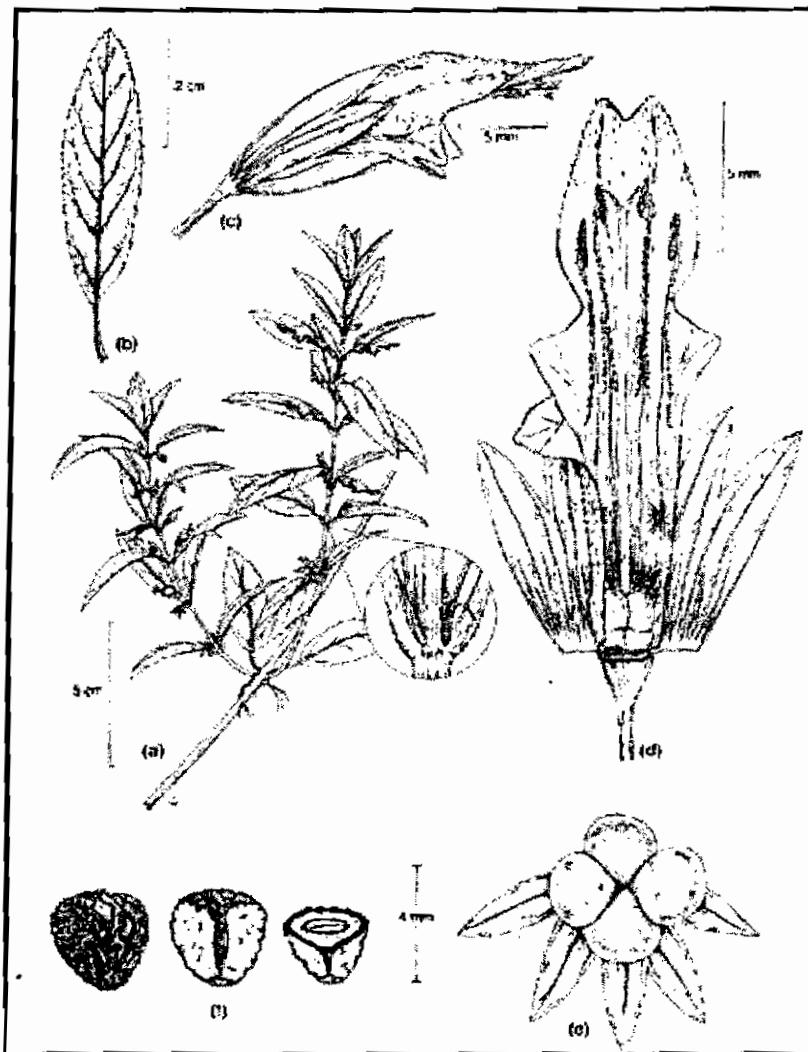


Figure 63. *Stenogyne angustifolia*: (a) horizontal stem growing on pahoehoe lava; (b) close-up of flower; (c) Dodonaea Mixed Shrubland in Kipuka Kalawamauna where the species is abundant; and (d) typical habitat in Open *Metrosideros* Treeland with sparse shrub understory.

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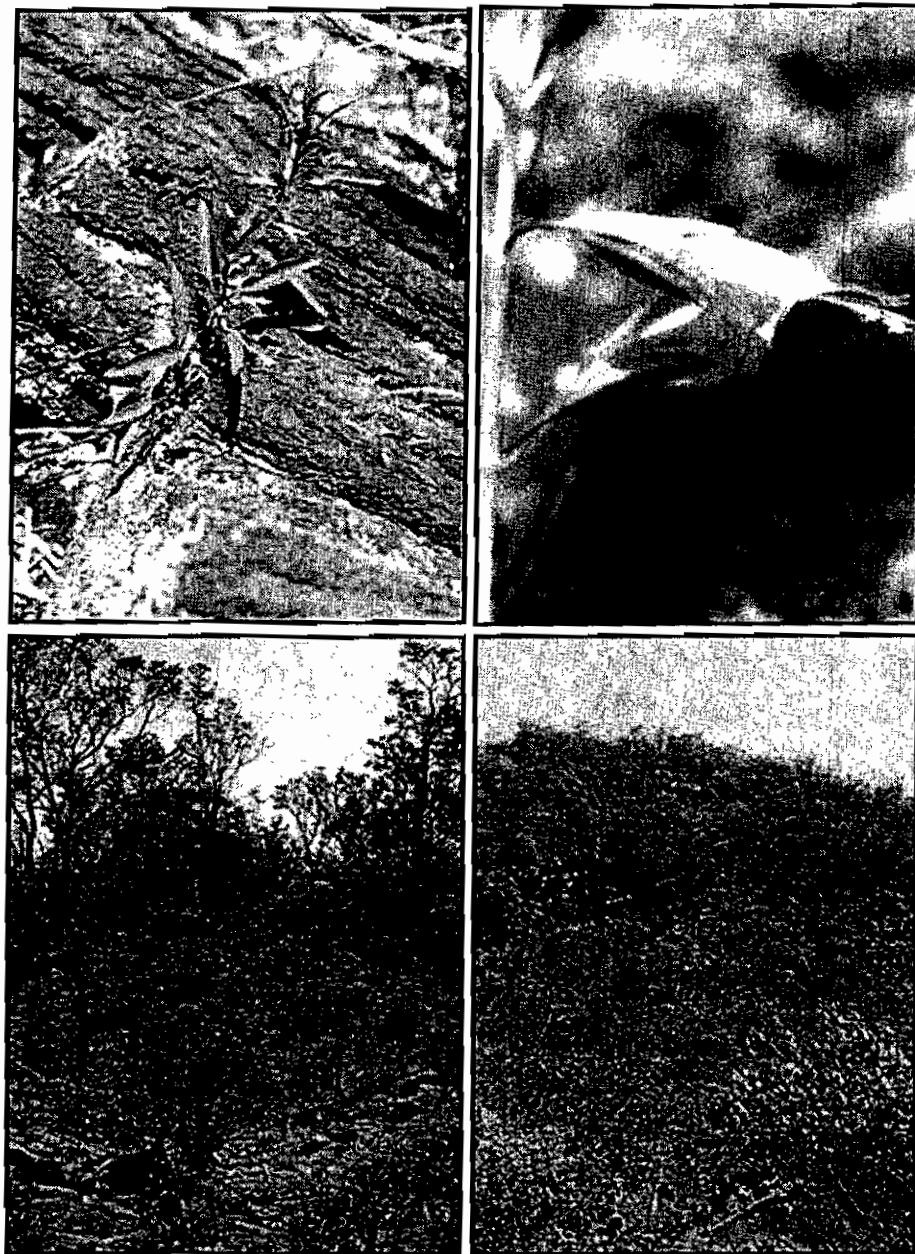
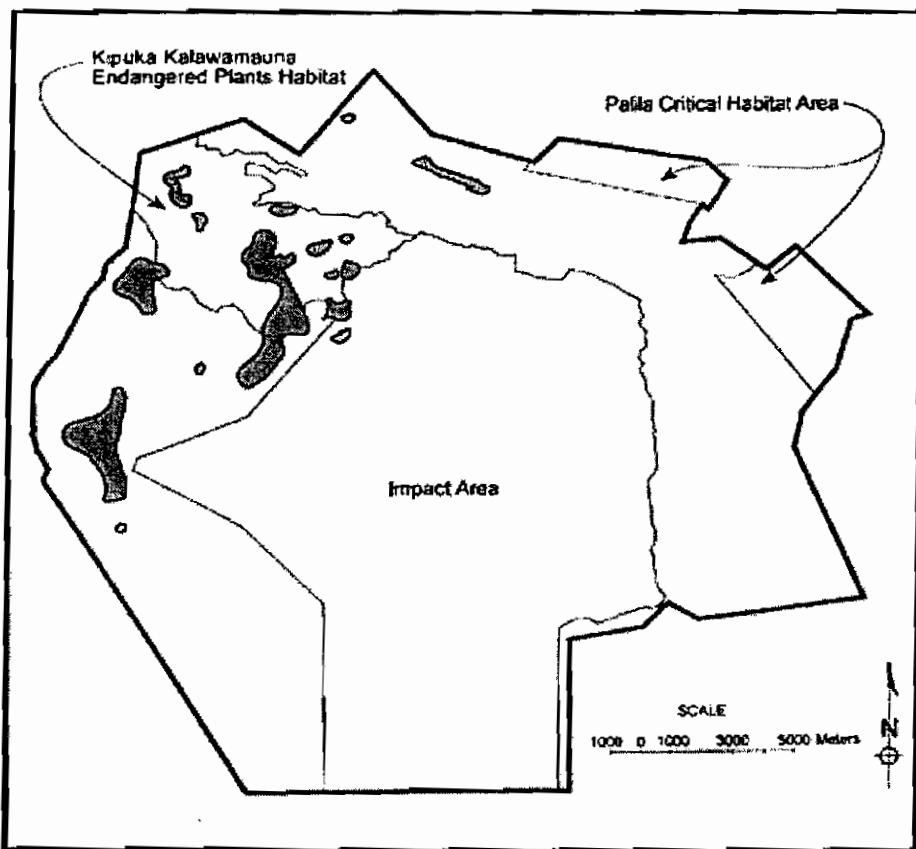
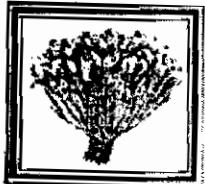


Figure 64. Distribution of *Stenogyne angustifolia* on Pohakuloa Training Area, Hawaii.



Tetramolopium arenarium (A. Gray) Hillebr.



Family: Asteraceae (Compositae, Sunflower Family)

Common Name: Mauna Kea Pamakani

Federal Status: Endangered

Description:

Life Span: perennial. **Habit:** erect shrub to up 2 m tall; single-stemmed at the base, branching above. **Vegetative:** stems round; leaves alternate, oblanceolate, the margins entire, usually evenly covered with short, soft hairs. **Floral:** several heads in dense clusters at the tips of branches; bracts that subtend the florets are up to 4 mm long, lance-shaped; ray florets numerous and the petal usually white and becoming recurved; disk flowers maroon or rarely yellow; pappus white and up to 4 mm long. **Fruit:** an achene with 1-4 nerves.

Distribution:

Historical: Maui and Hawaii. **Current:** Two populations are known along New Bobcat Trail and Kona Highway within the Kipuka Kalawamauna Endangered Plants Habitat on the installation.

Habitat:

Substrate: *Tetramolopium arenarium* is extremely rare on very old Mauna Kea flows (> 10,000 years old). **Plant Communities:** *Dodonaea* Mixed Shrubland

Estimated Number of Individuals on PTA: < 150

Threats: Damage from rooting and trampling by feral hogs, invasion of habitat by fountain grass (*Pennisetum setaceum*), wildfire, dust from a road that bisects the populations, and extremely small numbers are the major threats to this species. Apparently it is not palatable to feral sheep and/or goats.

Comments: Several subspecies and varieties of *T. arenarium* have been described, but recent nomenclatural debate precludes any further segregation at this time. Although the plant is extremely rare, *T. arenarium* is easy to germinate and establish in the greenhouse or field.

Figure 65. *Tetramolopium arenarium*: (a) typical flowering branch; (b) simple leaf with entire margin; (c) side view of single head from inflorescence; (d) top view of single head; (e) ray floret; (f) disk floret; and (g) achene with pappus and in cross-section.

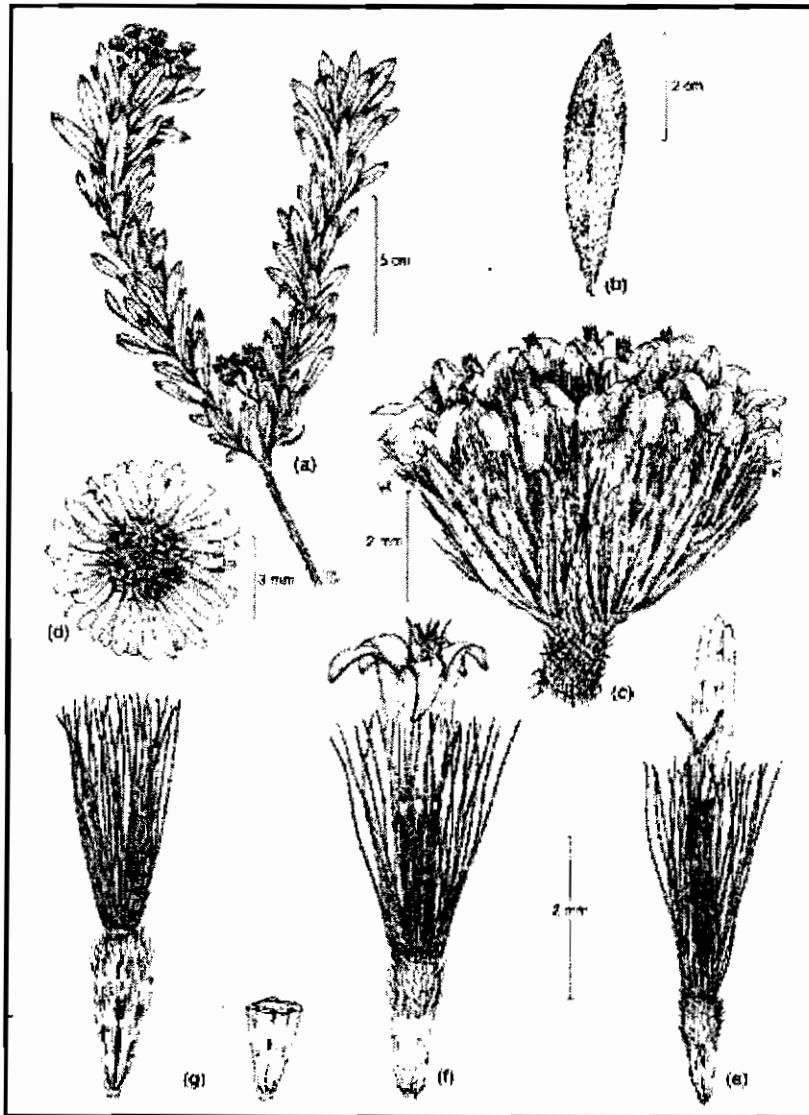


Figure 66. *Tetramolopium arenarium*: (a) mature, erect individual showing candelabra form; (b)

flowering branch with cluster of heads at the tip; (c) cluster of heads (disks florets maroon and rays florets white); and (d) typical *Dodonaea* Mixed Shrubland habitat within Kipuka Kalawamauna.
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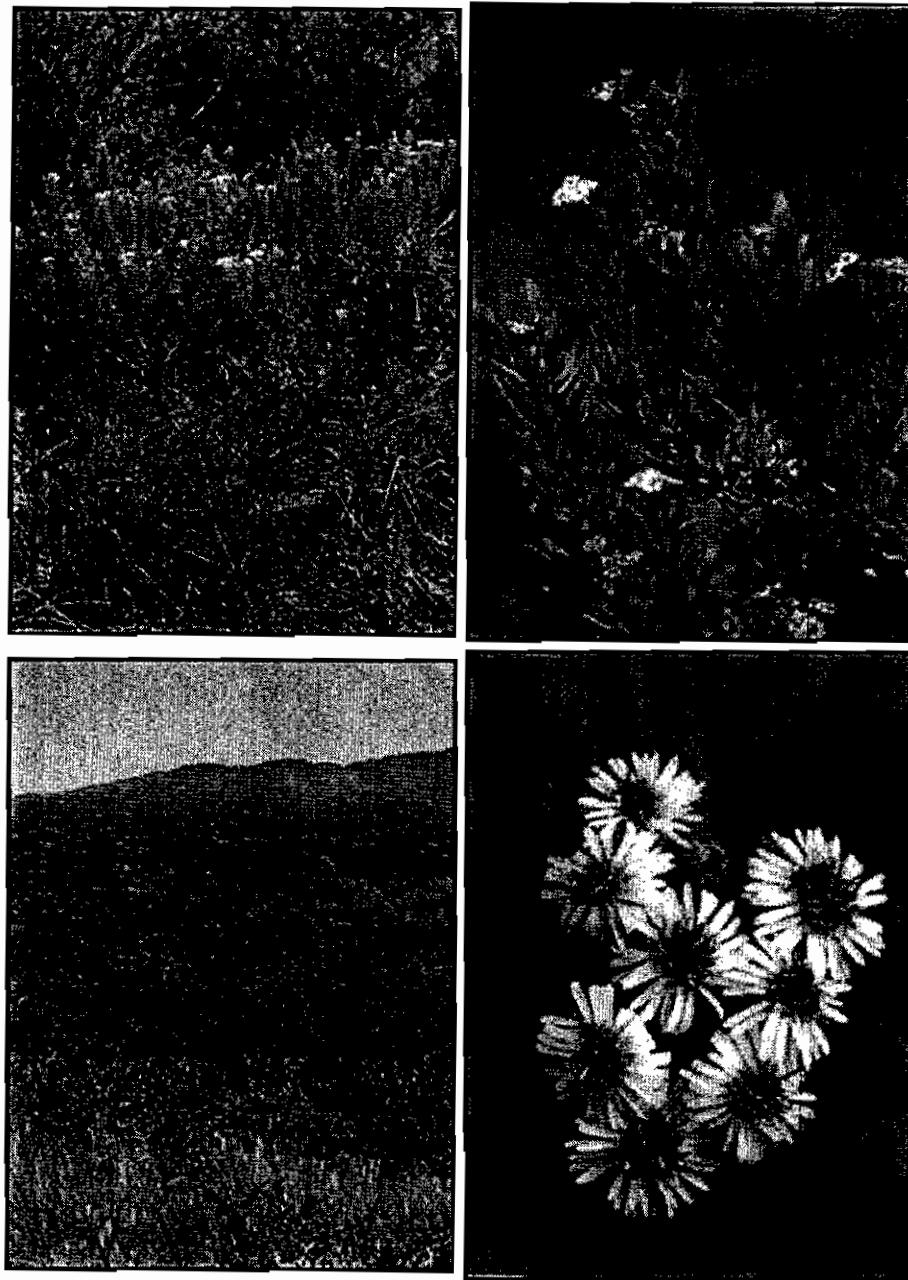
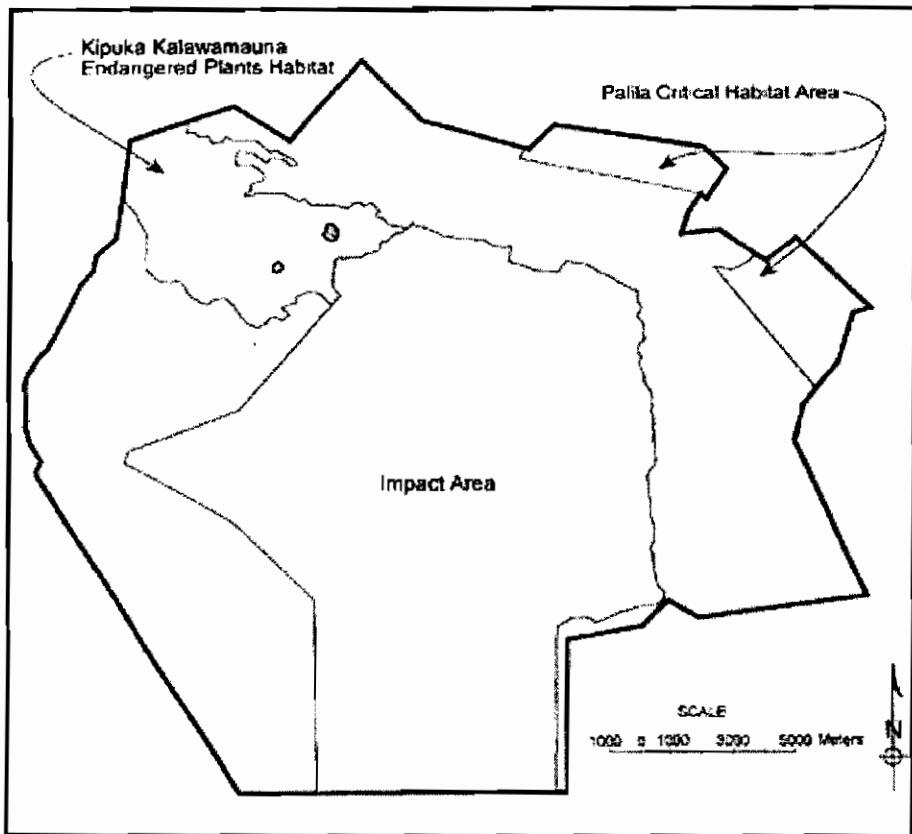
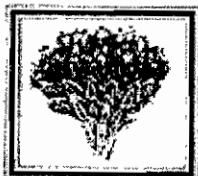


Figure 67. Distribution of *Tetramolopium arenarium* on Pohakuloa Training Area, Hawaii.



***Tetramolopium consanguineum* (A. Gray) Hillebr.
ssp. *leptophyllum* (Sherff) Lowrey var. *leptophyllum***



Family: Asteraceae (Compositae, Sunflower Family)

Common Name: Narrow-leaf Pamakani

Federal Status: Species of Concern

Description:

Life Span: perennial. **Habit:** erect shrub up to 2 m tall; single-stemmed at the base, branching above. **Vegetative:** stems round; leaves linear with stiff hairs along the midrib and margins, usually glandularly dotted, margins typically entire but occasionally with a few irregular teeth. **Floral:** numerous heads in tight clusters, which barely protrude beyond the leaves at the branch tips; bracts that subtend the flowers are up to 2.5 mm long and oblanceolate with erose margins; ray florets numerous and petals lavender or white; disk florets maroon; pappus brownish and less than 3 mm long. **Fruit:** an achene with 2-6 nerves.

Distribution:

Historical: Kauai (doubtful) and Hawaii. **Current:** The species is common from the southern boundary of Kipuka Kalawamauna Endangered Plants Habitat to the northern

boundary of Kipuka Alala. A small population has been found growing within Kipuka Alala.

Habitat:

Substrate: The species is common on Mauna Loa pahoehoe and aa flows varying from 900-5000 years old. **Plant Communities:** Barren Lava, Sparse *Metrosideros* Treeland, Open *Metrosideros* Treeland with sparse shrub understory, Open *Metrosideros* Treeland with dense shrub understory, Intermediate *Metrosideros* Mixed Treeland, Open *Dodonaea* Shrubland, Dense *Dodonaea* Shrubland, *Myoporum* Shrubland, *Myoporum-Dodonaea* Shrubland, *Myoporum-Sophora* Mixed Shrubland, and *Myoporum-Sophora* Shrubland with forb understory.

Estimated Number of Individuals on PTA: > 10,000

Threats: Growing in disturbed areas along roadsides makes *Tetramolopium consanguineum* susceptible to damage from dust. Also, feral sheep and goats use the roads and frequently browse the plants near the roadside.

Comments: The species is fairly common at PTA, which represents the taxon's only known location. Another variety (*T.c. var. kauense*) of the species was known from the Kau District near South Point, but recent surveys into the area have failed to relocate the plants. *Tetramolopium consanguineum* is easily germinated and established in the greenhouse or field.

Figure 68. *Tetramolopium consanguineum* var. *leptophyllum*: (a) flowering branch; (b) simple leaves with irregularly toothed and entire margins (insert showing multicellular hairs along leaf margins); (c) side view of single head from inflorescence; (d) top view of single head; (e) ray floret; (f) disk floret; and (g) achene with pappus and cross-section showing multiple nerves per face.

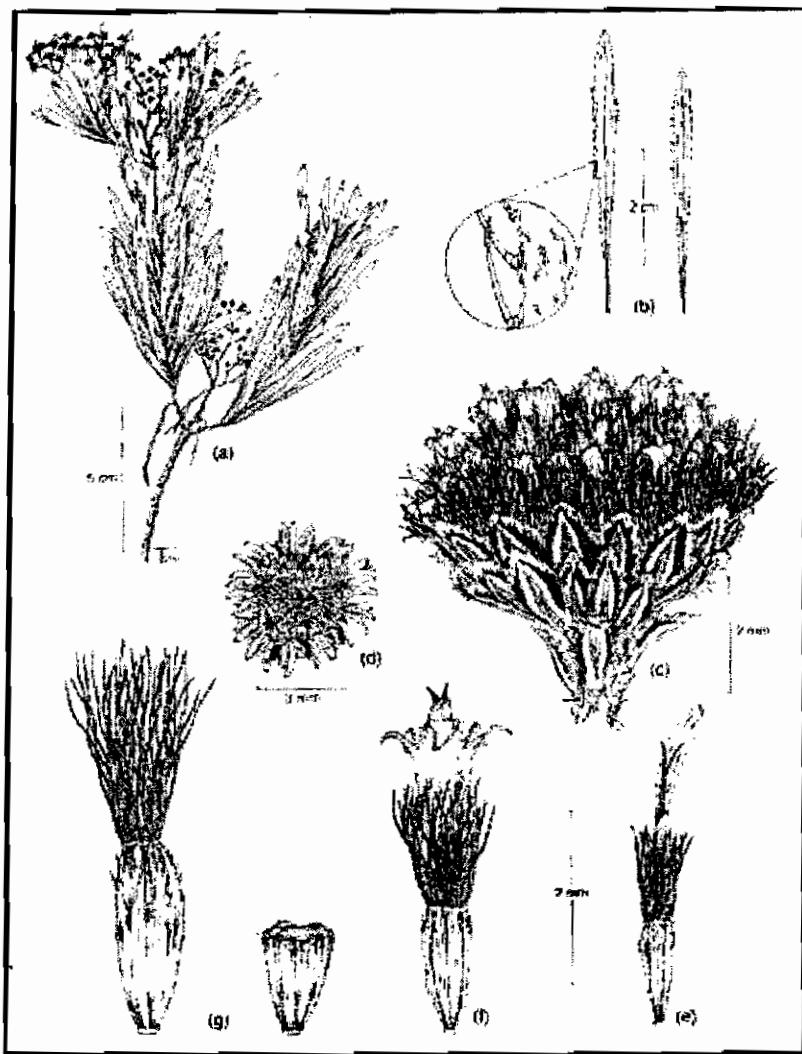


Figure 69. *Tetramolopium consanguineum* var. *leptophyllum*: (a) young plant growing in pahoehoe lava; (b) mature individual; (c) cluster of heads (disk florets maroon and ray florets white); and (d) typical habitat in Open Metrosideros Treeland with sparse shrub understory where the species is abundant.

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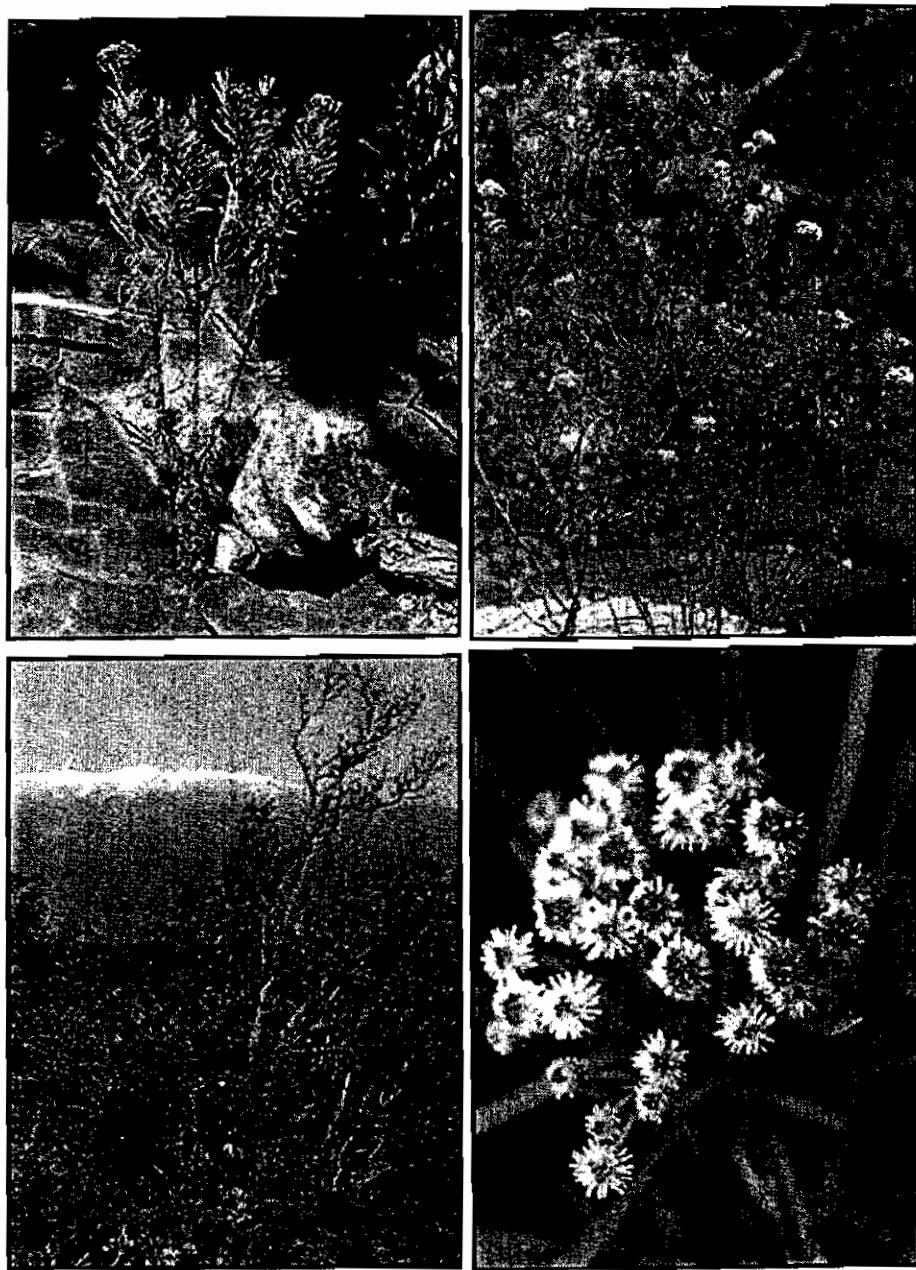


Figure 70. Distribution of *Tetramolopium consanguineum* var. *leptophyllum* on Pohakuloa Training Area, Hawaii.